If b is a function only of $x_2, \ldots\ldots$, the first term on the right is the contribution from x_1; for any given *fixed* x_0, the *average* of this term is given by (5), and we have

$$(x_0) = r\sigma_0\left[r\frac{(x_0)}{\sigma_0} + B'\right] + b\sigma_0, \qquad (9)$$

in which the first term is the contribution due *in the long run* to x_1. *If*, as frequently happens, B' is practically zero, then

$$(x_0) = r^2(x_0) + b\sigma_0, \qquad (10)$$

in which the first term on the right is the *average contribution*, from x_1, to the *particular* value (x_0). Apparently, Dines's theorem is, or should be, intended as a statement of (10).

Clearly, the S. D. of (x_0) is not σ_0, which would seem to dispose of Walker's objection to Dines's theorem. Krichewsky has pointed out, moreover, that Dines's theorem may be interpreted to be a statement of equation (7), in which case it becomes identical with Walker's theorem when allowance is made for the fact that Walker adopts the S. D. as a measure of variation, while in (7) the variation is measured by the square of the S. D., or variance. Implicit in the theorem as thus interpreted, however, is the assumption of the independence of x_1 and the other variables; such independence is the exception rather than the rule. By equation (2) we can always divide the variance in the manner shown in (7); and we may regard the theorem of Dines and Walker as always holding for mere *covariation*. Unless x_1 is independent, however, the law does not hold for *cause and effect*. Walker does not seem to recognize the important distinction between these two cases. Krichewsky has attempted to provide a measure of *causal* influence, even when $x_1, x_2, \ldots\ldots$ are mutually dependent.

NOTES AND ABSTRACTS

INFLUENCE OF PRECIPITATION CYCLES OF FORESTRY[1]

The author made an analysis of the annual radial growth rings of trees in northern Idaho. White pine was the species studied. The trees were located in the Priest River watershed of the Kaniksu National Forest and the stumps of recently cut trees were used. In order to have a wide dispersion of age, five age classes were investigated, viz, 280, 230, 180, 140, and 75 year old trees were measured in each of the five groups, 8 to 15 dominent trees being measured in each group.[2]

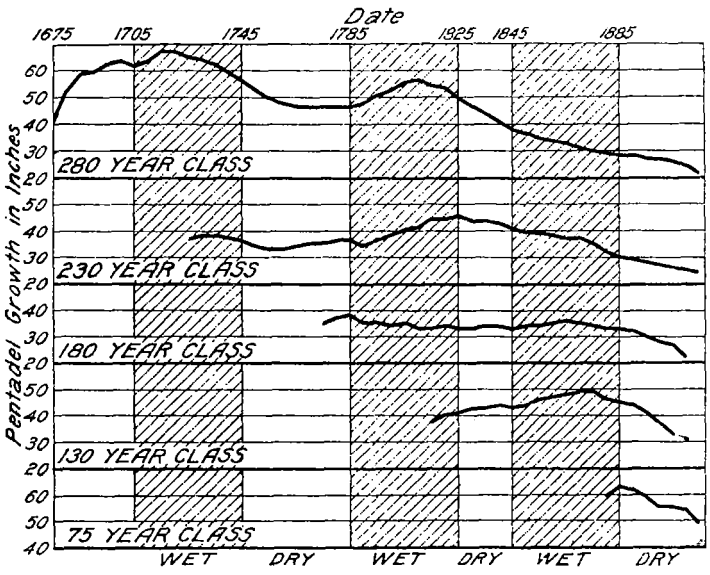

FIG. 1.—White pine growth, 1675–1925

The author plots the 5-year growth for each age class and smoothes the graph so formed by the use of a five-pentad moving mean. By this method general trends are made to stand out much clearer than in the unsmoothed means.

Figure 1 is the smoothed growth curves for each age class of white pine, 1675 to 1925.

The author points out that in every age class from the 280-year-old stand to the youthful 75-year-old stand, which normally should be experiencing its most vigorous increment, there is a rapid decrease in growth during the last 40 years. This is so distinct as to preclude any possibility of chance being the cause. Suppression could not have been responsible because the trees studied were ones which from their size must have been dominants, or in youth even superdominants; therefore, it is held that the only possible solution seems to lie in a deficiency of precipitation.

The 40 years since 1885 have obviously formed an exceedingly dry epoch.

The author further says:

> The evidence bearing upon the score of years between 1825 and 1845 also appears muddled at first sight. The 280-year class shows an exceptionally rapid decline, while the 180-year class reaches the trough of its first 140 years of growth. The 140-year class shows a slow acceleration, but relatively this can be considered a decided drop, for normally the period between 40 and 60 years should show the most rapid growth rate. Only the 230-year class is inconsistent, for it practically maintains its growth peak. Nevertheless, the vote seems to be 3 to 1 that this was a dry period.
>
> Between 1785 and 1825 the 280-year class exhibits a remarkable peak, almost incredible in a stand which was already 140 years old. This certainly indicates an abundance of precipitation in a striking manner, as does the next younger group, which after 50 years of poor growth at the age of 95 started a rapid acceleration which lasted for 35 years. Only the 180-year class causes scientific sorrow, for no 40-year old stand should slump, no matter how slightly, during wet years. But here again the majority should prevail, pending further investigation, and so this 40-year period should be called a wet one on the growth records. * * *
>
> Going back from 140 to 180 years ago, only two age classes remain. Both of these indicate clearly a dry period. The older drops rapidly and then maintains the lowest level of its first 180 years. The younger, just when it should be making its best growth, also reaches the low point of its first 180 years.
>
> In regard to the 40 years before this period, we have only the oldest age class to fall back upon. This reaches a peak, as one would expect for a stand of 60 to 100 years, and we can only surmise from its unusual height, exceeding all other points on any of the curves, that this was due to a wet phase of the cycle coming in conjunction with the most vigorous period of youth.

—*A. J. H.*

WEATHER IN THE AMERICAS AS AFFECTING TRADE

[Cable reviews to Commerce Reports, Nov. 7, 1927]

Argentina, October 29.—Rains throughout the country brought about a brighter commercial outlook during October, and * * *. The sowing of cottonseed is in

[1] Read by Robert Marshall before the Northern Rocky Mountain Section, Society of American Foresters and printed in Journal of Forestry, Vol. XXV, No. 4, April, 1927.

[2] The author's method of tree-ring measurement as described in a personal letter to the editor was as follows: I first examined each stump and chose some radius which was fairly close to the average in length, showed no growth abnormalities, such as are occasioned by knots, fire scars, insects, or other causes. * * * Along the radius I placed a narrow strip of stout paper and made a small pencil mark along the edge where each ring came. I worked, of course, from the outside to the center of the tree, so that I might date each year's growth. Western white pine is not characterized by double rings, so that difficulty in stem analysis was obviated. In the office I measured the distance between the marks on my strips of paper and thus obtained the width of each growth ring to the nearest hundredth of an inch.

full swing and prospects for the new crop have improved considerably as a result of rains which fell during last month throughout the Chaco and Corrientes.

Brazil, October 28.—In Bahia, Consul Howard Donovan reports a state-wide drought, affecting business unfavorably.

Chile, October 27.—The condition of agriculture still appears satisfactory, although the continuance of inclement weather is causing farmers to fear a recurrence of the wheat rust experienced last year. * * *

Costa Rica, October 27.—* * * The central plateau has experienced heavy seasonal rains during October, which have obstructed communication with the rural districts. * * *

Colombia, October 28.—* * * Heavy rains in the interior of the country are keeping the Magdalena River in excellent condition, so that cargo movement from the coast inland is uninterrputed.

Haiti, October 26.—Adverse weather conditions in Haiti continue to interfere with the normal movement of the coffee crop. * * *

Porto Rico, October 28.—Unfavorable weather has killed plants in the tobacco seed beds in several parts of the island, necessitating a resowing, which will delay planting several weeks in those regions.

Uruguay, October 28.—Sheep shearing has been retarded by the rains throughout the country during the first fortnight of October. * * *

METEOROLOGICAL SUMMARY FOR SOUTHERN SOUTH AMERICA, SEPTEMBER, 1927

By J. BUSTOS NAVARRETE, Director

[Observatorio del Salto, Santiago, Chile]

In September, 1927, the atmospheric circulation showed unusual activity and as a result the month was generally a period of unsettled, rainy weather.

The most important periods of fair weather under anticyclonic conditions were the following: 3d–4th, 8th–9th, 14th–18th, and 25th–28th.

The depressions bringing the most marked periods of unsettled weather and rain were those charted during the following intervals: 2d–3d, 5th–7th, 9th–11th, 12th–14th, 17th–20th, 21st–22d, and 23d–25th.

The region receiving rainfall extended from Coquimbo to Magellanes. There was marked excess in precipitation in all of the central region of Chile.—*Translated by W. W. Reed.*

METEOROLOGICAL SUMMARY FOR BRAZIL, SEPTEMBER, 1927

By J. DE SAMPAIO FERRAZ, Director

[Directoria de Meteorologia, Rio de Janeiro]

A smaller number of anticyclones crossed the continent in this month, but depressions were more active. Weather was generally unsettled in the south and center of the country, and several gales were registered in the south.

The first "high" appeared on the 8th. Before this, depressions held the sway with a strong gale on the 7th, from the Plata River northwards. The second anticyclone moved over the continent from the 13th to the 19th. On the 20th low pressures dominated again with strong gale in Argentine's coast.

The month closed with a third anticyclone which followed the usual northeast track.

Some late frosts were registered in the south doing some damage to vegetables. Crops generally, well throughout the country.

Rainfall was scarce in the north and center of the country. In the south precipitations were irregular, but on the average above the normals for the month.

Rio's weather ran unsettled in the first 20 days, improving after. Pressure and temperature almost normal. In the first decade winds were abnormally high, specially on the 2d, when Rio was struck by a fairly severe gale. Strong winds were felt again on the 27th.

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